

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

Claim 1. (Currently Amended) A method for generating to generate a preamble sequence to decrease a peak-to-average power ratio (PAPR) through at least two antennas in an orthogonal frequency division multiplexing (OFDM) communication system ~~including an inverse fast Fourier transform (IFFT) processor for IFFT transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time having a plurality of subcarriers actually in use and identified by unique numbers in a frequency domain~~, the method comprising the steps of:

generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via one of the at least two antennas; and first short preamble sequence with elements corresponding to the plurality of subcarriers, wherein data other than null data is inserted for elements associated with a subcarrier identified by a unique number that is an even number;

generating a second short preamble sequence with elements corresponding to the plurality of subcarriers, wherein data other than null data is inserted for elements associated with a subcarrier identified by a unique number that is an odd number; and

generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via another one of the at least two antennas preamble sequence in a time domain by transforming one of the first and second short preamble sequences according to a transmission rule by using an inverse Fast Fourier transform.

Claim 2. (Currently Amended) The method of claim 1, wherein the ~~second preamble sequence is defined as Pg(100:100), where:~~

$$P_g(-100:100) = \{0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\ 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\ 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ 0, -1, \\ 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, \\ 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, \\ 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, \\ 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, \\ 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0\}$$

*sqrt(2)*exp(i*pi/2)

PAPR is decreased through at least two antennas in the OFDM communication system.

Claim 3. (Currently Amended) The method of claim 1, wherein the first preamble sequence $P(-100:100)$ is defined as $P(-100:100)$, where:

~~$P(-100:100) = \{ -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0,$~~

~~$-1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0,$~~

~~$-1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, -1, 0,$~~

~~$-1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0,$~~

~~$-1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0,$~~

~~$0, 0,$~~

~~$-1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0,$~~

~~$+1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0,$~~

~~$-1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0,$~~

~~$-1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, 0,$~~

~~$-1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, 0, -1, 0, -1, 0, +1, 0, -1, 0,$~~

~~$\langle sgn(2), sgn(2) \rangle$~~

short preamble sequence is adapted to be transmitted via one of the at least two antennas.

Claim 4. (Currently Amended) [[A]] The method for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the method comprising the steps of:

~~generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, for one OFDM symbol period; and~~

~~generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, for a next OFDM symbol period after passage of the one OFDM symbol period of claim 3, wherein the second short preamble sequence is adapted to be transmitted via one of the at least two antennas.~~

~~Claim 5. (Currently Amended) The method of claim [[4]] 1, wherein the second preamble sequence is defined as Pg(-100:100), where:~~

first short preamble sequence is generated for next orthogonal frequency division multiplexing symbol period after passage of the one orthogonal frequency division multiplexing symbol period.

Claim 6. (Currently Amended) The method of claim [[4]] 5, wherein the first preamble sequence is defined as $P(-100:100)$, where:

$$\begin{aligned} P(-100:100) = \{ & -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, \\ & 0, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\ & -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1 \} \\ & \cancel{\text{sqn}(2)} \cancel{\text{sqn}(2)} \end{aligned}$$

second short preamble sequence is generated for a next orthogonal frequency division multiplexing symbol period after passage of the one orthogonal frequency division multiplexing symbol period.

Claim 7. (Currently Amended) [[A]] The method for generating a preamble sequence to decrease a peak to average power ratio (PAPR) through two antennas in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the method comprising the steps of:

generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via the first of the two antennas for one OFDM symbol period, and generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via the second of the two antennas for the one OFDM symbol period; and

generating the first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via the second of the two antennas for a next OFDM

~~symbol period after passage of the one OFDM symbol period, and generating the second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via the first of the two antennas for the next OFDM symbol period of claim 2, wherein the first short preamble sequence is adapted to be transmitted via a first of the at least two antennas for one orthogonal frequency division multiplexing symbol period and a second of the at least two antennas for a next orthogonal frequency division multiplexing symbol period after passage of the one orthogonal frequency division multiplexing symbol period.~~

Claim 8. (Currently Amended) The method of claim 7, wherein the second preamble sequence is defined as Pg(-100:100), where:

$$\begin{aligned} \text{Pg}(-100:100) = & \{0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\ & 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, \\ & 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, -1, 0\} \\ & \times \text{seq}(2) * \text{seq}(2) \end{aligned}$$

~~short preamble sequence is adapted to be transmitted via the second of the at least two antennas for one orthogonal frequency division multiplexing symbol period and the first of the at least two antennas for the next orthogonal frequency division multiplexing symbol period after passage of the one orthogonal frequency division multiplexing symbol period.~~

Claim 9. (Currently Amended) The method of claim [[7]] 1, wherein the first preamble sequence is defined as $P(-100:100)$, where:

$$\begin{aligned} P(-100:100) = & \{ -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, \\ & -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, \\ & 0, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\ & -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1 \} \\ & *sqrt(2)*sqrt(2) \end{aligned}$$

second short preamble sequence is $Pg(-100:100)$ and is defined as

$$\begin{aligned} Pg(-100:100) = & \{ 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\ & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, \\ & 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, -1, 0 \} \\ & *sqrt(2)*sqrt(2) \end{aligned}$$

Claim 10. (Currently Amended) [[An]] The apparatus for generating a preamble sequence to decrease a peak to average power ratio (PAPR) through at least two antennas in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the apparatus comprising:

a first antenna preamble sequence generator for generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, the first preamble sequence being adapted to be transmitted via one of the at least two antennas; and

~~a second antenna preamble sequence generator for generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, the second preamble sequence being adapted to be transmitted via another one of the at least two antennas~~ method of claim 1, wherein the first short preamble sequence is P(-100:100) and is defined as

$$\begin{aligned} P(-100:100) = \{ & -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, \\ & -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, \\ & 0, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, \\ & +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\ & -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1 \} \\ & *sqrt(2)*sqrt(2) \end{aligned}$$

Claim 11. (Currently Amended) [[The]] An apparatus of claim 10, wherein the second preamble sequence is defined as Pg(-100:100), where:

$$\begin{aligned} Pg(-100:100) = \{ & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, -1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\ & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ & 0, 1, \\ & 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, \\ & 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0 \} \\ & *sqrt(2)*sqrt(2) \end{aligned}$$

to generate a preamble sequence to decrease a peak-to-average power ratio in an orthogonal frequency division multiplexing communication system having a plurality of subcarriers actually in use and identified by unique numbers in a frequency domain, the apparatus comprising:

a first antenna preamble sequence generator to generate a first short preamble sequence with elements corresponding to the plurality of subcarriers, wherein data other than null data is inserted for elements associated with a subcarrier identified with a unique number that is an even number;

a second antenna preamble sequence generator to generate a second short preamble sequence with elements corresponding to the plurality of subcarriers, wherein data other than null data is inserted for elements associated with a subcarrier identified with a unique number that is an odd number; and

an inverse fast Fourier transform (IFFT) processor to generate a preamble sequence in a time domain by transforming one of the first and second short preamble sequences according to a transmission rule by using an IFFT.

Claim 12. (Currently Amended) The apparatus of claim [[10]] 11, wherein the ~~first~~ preamble sequence is defined as $P(-100:100)$, where:

$$\begin{aligned} P(-100:100) = & \{ -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, \\ & -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, \\ & 0, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & +1, 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \\ & -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, \\ & -1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, 0, -1, 0, -1, 0, \\ & -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, 0, \} \\ & *sqrt(2)*sqrt(2) \end{aligned}$$

second short preamble sequence is $Pg(-100:100)$ and is defined as

$$\begin{aligned} Pg(-100:100) = & \{ 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, +1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, \\ & 0, -1, 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, \\ & 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, +1, 0, -1, \\ & 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, +1, 0, +1, 0, -1, 0, -1, 0, -1, \\ & 0, -1, 0, +1, 0, +1, 0, +1, 0, +1, 0, +1, 0, -1, 0, +1, 0, +1, 0, +1, \\ & 0, +1, 0, -1, 0, -1, 0, -1, 0, -1, 0, +1, 0, -1, 0, +1, 0, -1, 0, -1, 0, \} \\ & *sqrt(2)*sqrt(2) \end{aligned}$$

Claim 13. (Currently Amended) [[An]] ~~The apparatus for generating a preamble sequence to decrease a peak-to-average power ratio (PAPR) in an orthogonal frequency division multiplexing (OFDM) communication system including an inverse fast Fourier transform (IFFT) processor for IFFT transforming an input preamble sequence for a plurality of subcarriers in a frequency domain and generating a preamble sequence corresponding to the subcarriers in a time domain, the apparatus comprising:~~

~~a preamble sequence generator for generating a first preamble sequence in which odd data of the preamble sequence becomes null data and even data of the preamble sequence becomes data, for one OFDM symbol period, and generating a second preamble sequence in which the even data of the preamble sequence becomes null data and the odd data of the preamble sequence becomes data, for a next OFDM symbol period after passage of the one OFDM symbol period of claim 11, wherein the first short preamble sequence is P(-100:100) and is defined as~~

$$\begin{aligned} P(-100:100) = \{ & -1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,+1, 0, \\ & -1, 0,-1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0,-1, 0,+1, 0, \\ & -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1, 0,-1, 0, \\ & -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0, \\ & -1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0,+1, 0, \\ & 0, 0, \\ & -1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0, \\ & +1, 0,+1, 0,-1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,-1, 0, \\ & -1, 0,-1, 0,-1, 0,-1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,+1, 0, \\ & -1, 0,+1, 0,+1, 0,-1, 0,+1, 0,+1, 0,+1, 0,-1, 0,-1, 0,-1, 0, \\ & -1, 0,-1, 0,+1, 0,-1, 0,-1, 0,+1, 0,+1, 0,-1, 0,-1, 0,+1, 0,-1 \} \\ & *sqrt(2)*sqrt(2) \end{aligned}$$

Claims 14-18 (Canceled)